ORIGINAL

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	
Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems	PR Docket No. 93-[illegible]

PETITION FOR RECONSIDERATION OF HUGHES TRANSPORTATION MANAGEMENT SYSTEMS

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April 24, 1995

SUMMARY

Hughes Transportation Management Systems manufactures, and is currently deploying on behalf of state transportation authorities, the Vehicle to Roadside Communications ("VRC") system, which allows rapid communications between base stations installed along major highways and mobile transponders mounted in passing vehicles. VRC is used for a variety of services, including commercial vehicle monitoring, automatic toll collection, and traffic control. The Commission recently adopted new rules governing the Location and Monitoring Service ("LMS"), which includes systems such as VRC, which operate over very small geographic areas ("non-multilateration systems"), as well as a separate category of systems that provide wide-area vehicle location services ("multilateration systems").

One of the new rules requires that both multilateration and non-multilateration systems adhere to a very restrictive frequency tolerance standard. The standard is intended to prevent interference to other LMS facilities operating on adjacent frequency bands. For non-multilateration technologies such as VRC, however, this new requirement is both unnecessary and unduly burdensome, and Hughes petitions the Commission to eliminate, or at least modify this rule.

A number of LMS systems have already been installed, are under construction, or are now being planned. The frequency tolerance requirement will drive equipment costs to untenable levels, and will necessitate expensive modifications to existing facilities. Moreover, these changes would result from adoption of a rule that is not supported by the record, and is not needed to address any real concerns regarding interference. Non-

multilateration systems are very unlikely to cause interference to other systems, both because of their limited range, and because the amount of spectrum needed for such systems is less than the total amount allocated for their use, making informal coordination an effective solution in the rare case of out-of-band interference. Furthermore, any unlikely occurrence of interference could easily be addressed by adopting other technical requirements for LMS, two of which have been proposed herein by Hughes. These would not unduly burden LMS service providers, unlike the newly adopted frequency tolerance rule.

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In the Matter of	)	
Amendment of Part 90 of the Commission's Rules to Adopt Regulations for Automatic Vehicle Monitoring Systems	)	PR Docket No. 93-61

PETITION FOR RECONSIDERATION

Hughes Transportation Management Systems ("Hughes") hereby respectfully petitions the Commission to reconsider, in part, the new rules for the Location and Monitoring Service ("LMS") adopted in the Report and Order in the above-captioned proceeding, released February 6, 1995 (the "Report and Order").[1/]

Hughes generally supports the Commission's action in adopting new rules for the Location and Monitoring Service.[2/] However, for the reasons discussed below, Hughes requests reconsideration of the applicability of the frequency tolerance, contained in Section 90.213 of the new rules, to so-called non-multilateration LMS systems. See Report and

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1/ The final rules for LMS were published in the Federal Register on March 23, 1995. See Automatic Vehicle Monitoring Systems, 60 Fed. Reg. 15,248.

2/ Throughout this proceeding, Hughes has actively supported most of the provisions that have been adopted with the new rules, including: allocation of at least 6 MHz within the 902-928 MHz band for exclusive non-multilateration use, elimination of the proposed labelling requirement, adoption of an eight-month construction period, designation of LMS systems on the basis of system type rather than bandwidth, and antenna height-above-ground and ERP limits, etc. See Hughes Comments of June 29, 1993.

Order at 59.[3/] Hughes requests that the Commission delete this requirement for such systems, or, in the alternative, modify the rule as proposed below.

I. BACKGROUND

A. The Rulemaking Proceeding

On March 11, 1993, the Commission issued a Notice of Proposed Rulemaking (the "NPRM"),[4/] proposing new rules for Automated Vehicle Monitoring ("AVM") services. AVM, formerly subject to interim rules adopted in 1974, encompasses a variety of vehicle and highway-related communications services, such as vehicle location, toll collection, commercial truck administration, traffic monitoring and safety advisory services. AVM services fall into two general categories. The first category, multilateration services, includes vehicle location services in which a pulsed signal is transmitted by a vehicle-mounted mobile transponder. This signal is received by fixed receivers spaced within a large geographic area, and the differences between receivers in time of receipt of the pulsed signal are used to calculate the location of each transponder-equipped vehicle.

The second category of AVM includes non-multilateration services, a broad category covering systems that use fixed base stations, or "readers," that exchange information with transponders mounted in vehicles passing through the coverage area for each reader. These services typically operate at much lower power, and with much smaller

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3/ See also Automatic Vehicle Monitoring Systems, Second Erratum, (released March 1, 1995) at ¶ 11 (correcting amended rule Section 90.213).

4/ 8 FCC Rcd. 2502. The NPRM was issued in response to a Petition for Rulemaking filed by North American Teletrac and Location Technologies ("Teletrac").

coverage areas, than multilateration systems. Highly localized AVM services such as automated toll collection, road condition advisories, and commercial truck status monitoring fall into this category.

The NPRM proposed redesignating AVM as the Location and Monitoring Service ("LMS"), allocating the 902-928 MHz band for LMS, and segmenting the band into multilateration and non-multilateration subbands, in order to avoid potential interference between different services.[5/] The NPRM also proposed a number of technical and service rules for each LMS category.

In the final rules for LMS adopted in the Report and Order, the Commission retained the dichotomy between multi- and non-multilateration systems, and allocated separate portions of the 902-928 MHz band for each type of service.[6/] The Commission also adopted many of the rules originally proposed in the NPRM, with some modifications, including a revision of the original proposal regarding frequency tolerance.

In the NPRM, the Commission proposed that multilateration systems be limited to a frequency tolerance of 0.0005%, and that non-multilateration systems not be subject to a specified frequency tolerance. Frequency tolerance describes the amount of allowable variation from the authorized frequency of a transmitter, expressed as a percentage

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5/ The NPRM originally classified the two types of LMS services as "narrowband" and "wideband," but these were changed to multilateration and non-multilateration services in the Report and Order.

6/ The final allocation actually increased the total bandwidth for non-multilateration services over that originally proposed in the NPRM, with a total of 12 MHz each exclusively for multilateration and non-multilateration systems, and a 2 MHz band shared by multilateration and non-multilateration services.

of that authorized frequency. Thus, a transmitter restricted to a frequency tolerance of 0.0005% (or 5 parts per million ("ppm")), operating at 915 MHz, may vary within a range of .000005 times 915 MHz, or 4.575 kHz, on either side of its authorized frequency. The purpose of this requirement is to prevent frequency variation that might cause interference to other transmitters licensed on adjacent frequencies.

In its comments on the NPRM, Teletrac, a multilateration service provider, recommended that the frequency tolerance be reduced to 0.00025% (2.5 ppm), and that the requirement also apply to non-multilateration systems. Teletrac Comments at 49. Teletrac argued that this was necessary because non-multilateration systems would "have an incentive to locate close to the band edges," implying that this would avoid likely interference by out-of-band emissions of non-multilateration transmitters. Id.

Hughes and several other commenters opposed Teletrac's suggestion, noting that non-multilateration equipment costs to meet such a stringent standard would be excessive, in view of the fact that non-multilateration systems transmit over short ranges, and are therefore unlikely to overlap with other stations on adjacent bands. Surprisingly, however, the Commission agreed with Teletrac's recommendation, and adopted the 0.00025% frequency tolerance for non-multilateration LMS systems in the Report and Order. As described in greater detail below, this unnecessary regulatory requirement would place a significant economic burden on a major segment of the existing non-multilateration industry. There is not a sufficient basis in the record for this decision, and it should be reconsidered.

B. The Hughes Vehicle to Roadside Communications System

Hughes' Vehicle to Roadside Communications ("VRC") system is a non-multilateration system offering a variety of traffic-related services. The system employs active transponders, mounted in passing vehicles, that actually transmit identification and data-carrying signals in response to reader interrogation.[7/]

VRC uses sophisticated time-sharing techniques that enable each reader to rapidly differentiate between and accurately process a large number of transponder signals. Thus, a VRC reader can interrogate, identify, and exchange two-way information with every vehicle in a multi-lane environment, operating on a single frequency, even at high vehicle speeds. This increases reliability and reduces construction and maintenance costs in high-traffic density areas such as toll-plazas and major highway intersections. In addition, multiple VRC readers can be networked for centralized data processing and traffic monitoring, and VRC transponders can be connected to in-vehicle information displays.

Through use of low-power, active transponders, VRC offers system users the ability for mobile data storage, and to transfer extensive information across multiple traffic lanes between readers and vehicles passing at highway speeds without the need for expensive and delay-causing lane barriers. This capability is crucial to many types of new, innovative vehicle and traffic operations currently being implemented or planned. For example, VRC permits local authorities to verify commercial truck credentials, inspection status, and vehicle weight in real time, and to monitor hazardous material shipments, without traffic congestion

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7/ Certain other non-multilateration technologies rely on "passive" tags, which reflect the reader signal, modified to contain identifying information.

and delays caused by repetitious stops at inspection or weigh stations. The increased data handling capability of VRC's active transponders also will enhance many safety and commercial traffic services, enabling rapid exchange of continuously updated information such as road and traffic conditions, service availability, and route changes. As illustrated in the following discussion, VRC's active transponder technology already is a major part of the LMS landscape, and offers the public a variety of important services not available with other designs.

Under contract to state authorities and the government of Canada (and funded in part by the Federal Highway Administration), Hughes is installing a network of VRC facilities along Interstate Highway 75, passing through Florida, Georgia, Tennessee, Kentucky, Ohio, Michigan, and along Canada Highway 401 in Ontario. The system, which operates pursuant to Commission licenses that have been issued to state transportation departments, is known as I-75/AVION, and consists of VRC readers deployed in the vicinity of truck weigh stations and VRC transponders mounted in commercial trucks. As trucks pass through the monitored segment of highway, readers interrogate transponders and transmit individualized messages informing drivers whether they are required to stop and be weighed at the next weigh station. Drivers informed that they need not stop for weighing will thus avoid unnecessary delay caused by highway exit and reentry and waiting in line at truck scales.

Hughes also provides I-75/AVION compatible equipment for the Heavy Vehicle Electronic License Plate ("HELP, Inc.") network, which permits weigh station bypass and other commercial vehicle services on highways in Washington, Oregon,

California, Arizona, New Mexico, Texas, Utah, Colorado, Montana, and Minnesota. In addition, Hughes has been selected to install a VRC system to provide completely electronic toll collection services along Canada Highway 407 in Toronto, Ontario. This system, which Canadian authorities specified to be I-75/AVION compatible, will permit toll collection without the need to restrict vehicle speed or lane position, and without use of coins, tickets or human toll collectors.

In the Summer of 1993, Hughes began installation of a VRC-based electronic toll collection system on the Ohio Turnpike, and, pursuant to Commission licenses, currently is expanding the system to cover this major artery across the entire state. When completed, this system will enable both weigh station bypass on Interstate Highway 75, as part of the I-75/AVION network, and automatic toll collection on the Ohio Turnpike, using a single active VRC transponder in each commercial vehicle.

The VRC technology has been selected by every company that has submitted proposals for electronic border-crossing systems between the United States, Canada and Mexico, which will alleviate much of the congestion now resulting from routine immigration and customs checks at these borders. Further, several private trucking companies are preparing to implement vehicle management systems using Hughes' VRC technology.

II. DISCUSSION

A. The Frequency Tolerance Contained in the New LMS Rules Would Impose an Undue Burden On Providers of Non-multilateration Services Using Active Vehicle Transponders.

As discussed above, the frequency tolerance adopted for LMS transmitters is 0.00025%, or 2.5 ppm. Report and Order at 47. This tolerance is exceedingly strict, and

offers little practical value, if any, for non-multilateration systems. The need for such a requirement must be carefully weighed against the significant adverse impact that would result for non-multilateration LMS technologies in general if this requirement were enforced. Although the active transponder-based systems currently in operation do not meet this standard, these systems have neither caused interference to nor received interference from other licensed operations in the same band.

For Hughes VRC system readers, this frequency tolerance would mandate a significant design modification. The electronics hardware for each reader would need to be changed, including an expensive retrofit package for transmitters already constructed or manufactured.

More importantly, for VRC mobile transponders, equipment changes that would result from the 2.5 ppm frequency tolerance would drastically increase the cost per transponder, to the point where use of active transponders would be economically insupportable. Each non-multilateration program involves the deployment of many thousands of vehicle-mounted transponders.

For example, the I-75/AVION program, currently a feasibility demonstration project, already includes an authorization for over 4,000 transponders. Current projections indicate that the system eventually will interact with over 20,000 transponders in commercial trucks. The HELP, Inc. system is projected to deploy over 125,000 active truck transponders, and the Canadian Highway 407 project is estimated to require over 100,000 transponders. These numbers represent only a small fraction of the total deployment of vehicle transponders that will occur as more LMS services are offered. Applications such as

automatic toll collection, traffic monitoring, commercial vehicle logistics, and emergency communications services eventually will require millions of transponders throughout North America. A significant increase in the cost per transponder brought about by the need to comply with the Commission's frequency tolerance will make active transponder technologies prohibitively expensive.

The total costs to convert existing non-multilateration equipment to meet the frequency tolerance will be enormous, and may even exceed levels at which such systems can remain economically viable. Prospects for reasonable return on investments made in developing active transponder systems will be diminished severely. Ultimately, availability of this newly-developed technology, which offers a wealth of advanced traffic communications services, and which already is being implemented on behalf of a number of state traffic authorities, will be severely curtailed or eliminated.

B. There is No Technical Need Or Justification for Applying the 2.5 ppm Frequency Tolerance to Non-multilateration Systems.

The frequency tolerance for non-multilateration operations is not supported by the record, and is not needed to ensure that systems on adjacent channels are safe from harmful interference. In adopting this requirement, the Commission cites only the original comments of Teletrac for the proposal that the same narrow tolerance be applied to both multi- and non-multilateration systems. Report and Order at 47.[8/] Teletrac relied on an assumption that non-multilateration systems "will have an incentive to locate close to band

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[8/] The Commission also notes that four other commenters: Hughes, MobileVision, SBMS, and Mark IV, all registered their opposition to establishing a frequency tolerance for non-multilateration systems. Id.

edges, which suggests that they will employ strict frequency control." Teletrac Comments of June 29, 1993 at 49. There is no basis for such an assumption, especially in light of the fact that the new rules provide a full twelve megahertz of contiguous spectrum for non-multilateration system use. See Report and Order at 28.[9/]

Another factor that will prevent out-of-band interference is the current emission mask requirement. See Report and Order at 49-50. The emission mask, which defines how much attenuation of LMS signals is required outside of specified subbands for each type of service,[10/] "will assure that multilateration and non-multilateration systems will not interfere with each other." Id. at 50. This specification more than adequately addresses any concerns that non-multilateration systems, operating "close to band edges," will interfere with multilateration operations in adjacent bands. Moreover, the emission mask adopted for LMS is more stringent than that applied to land mobile systems under Part 90 of the Commission's rules.[11/] Thus, effective interference protection across LMS band edges

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9/ Teletrac further asserted, and the Commission agreed, that the 2.5 ppm frequency tolerance is "less stringent than is currently required by Part 90 for 900 MHz land mobile systems." Teletrac Comments at 49, Report and Order at 47. As Hughes noted in its reply comments in this proceeding, however, this is not correct. While the Commission's rules provide for a frequency tolerance of 0.1 ppm for 900 MHz land mobile radios, 47 C.F.R. § 90.213(a), or 187 Hz at 935 MHz, this actually represents 1.5% of the total authorized bandwidth for a 12.5 kHz land mobile channel. Frequency variation of 2.5 ppm for LMS goes up to 4.5 kHz, but this is only 0.07% of the total bandwidth for a 6 MHz LMS channel, or less than 5% of the amount of variation permitted for land mobile systems in the same band.

10/ The emission mask for all LMS systems has been set at 55 + 10log(P) dB, where P is the highest emission (in watts) of the transmitter in question inside its authorized bandwidth. Id.

11/ Land mobile transmitters operating at 900 MHz are subject to a gradual "roll-off" of out-of-band signal strength, ranging from 25 to 70 dB, as displacement from the center of the authorized bandwidth increases. 47 C.F.R. § 90.209(c)(2).

already is accomplished without the need for the extremely restrictive frequency tolerance adopted for non-multilateration LMS systems.

A frequency tolerance of 2.5 ppm also does not add significantly to existing means to avoid interference between non-multilateration systems within designated subbands. As the Commission correctly observes, non-multilateration systems operate over relatively short ranges, typically on the order of a few hundred yards. See Report an Order at 18. As a result, instances of coverage overlap between facilities on adjacent channels will be rare. Moreover, antenna height and power limits for non-multilateration readers will guarantee that coverage areas remain size-limited.

The Commission also recognizes that informal coordination between non-multilateration operators has proven to be an effective means to avoid interference. Coupled with the highly localized nature of non-multilateration services, and the generous amount of contiguous spectrum now available, the informal process makes adjacent channel interference extremely unlikely, and the restrictive frequency tolerance is unnecessary. Thus, there is no need to adopt the overly restrictive non-multilateration requirement of the Report and Order.

Moreover, if the Commission remains concerned about the possibility of out-of-band interference between non-multilateration facilities, such concerns can easily be addressed through either of two less-burdensome alternatives:

1. Apply the current emission mask at the edges of the band authorized for each transmitter, rather than just at the edges of the entire subbands allocated for non-multilateration service.

The Commission adopted the emission mask, or out-of-band attenuation requirement, to be applied only at the specific frequencies that are at the edges of the

subbands allocated for each service. Id. at 49-50. This departs from the requirement for other services governed by Part 90, in which each transmitter is subject to an emission mask at the edges of the specific band for which it is licensed. See 47 C.F.R. 90.209. However, one of the non-multilateration subbands covers 12 MHz of contiguous spectrum. The vast majority of these systems do not require this much spectrum, and they will be licensed for smaller bands within the larger subband. If the Commission modified its LMS emission mask rule such that the mask applied to the edges of the specific band licensed for each fixed transmitter, then non-multilateration stations on adjacent channels would be fully protected, even in the unlikely event that the small coverage areas of such stations overlapped, or informal coordination was ineffective.

2. Adopt a frequency tolerance that reflects the bandwidth actually authorized for each facility.

As a protective measure, restrictive frequency tolerances have been established for services using much narrower bandwidths than will be required for non-multilateration technologies. For example, land mobile services, cited by the Commission, are restricted to bandwidths of less than 13.6 kHz when operating at 900 MHz. 47 C.F.R. § 90.209(b)(5). Non-multilateration services typically will be licensed for much larger bands. Hughes' VRC, for example, uses 6 MHz of authorized bandwidth. Analysis conducted by Hughes reveals that, at this wider bandwidth, frequency variation as high as 5% of the authorized bandwidth (0.033% frequency tolerance at 915 MHz) is difficult to detect, and is very unlikely to result in interference on adjacent channels. Accordingly, the Commission should adopt a greater frequency tolerance than that currently adopted. Hughes recommends a frequency tolerance of 0.066%, which would provide an adequate safeguard against adjacent-band interference

that is consistent with the 12 MHz of bandwidth allocated for non-multilateration devices, if one is needed at all.

C. Frequency Tolerance Is Not Needed for Non-multilateration Mobile Transponders, Which Operate at Very Low Power, and Only at Close Range to Readers.

Finally, even if the Commission persists in its decision to impose a restrictive frequency tolerance for non-multilateration systems, which it should not, such a rule should apply only to reader transmitters, and not to mobile transponders, provided that the transponders are designed to transmit only while in the "communications zone" of an associated reader. For such systems, transponders, which transmit at power levels far below that of readers, transmit only while passing in close proximity to a reader, and the coverage area of transponder transmissions is totally contained within that authorized for the readers.

For example, Hughes' VRC mobile transponders transmit at roughly 2 milliwatts, while VRC readers transmit at roughly 10 watts. Thus, transmit power of a VRC transponder is approximately 0.02% of that of a reader. Because transponders transmit only when interrogated by a reader, i.e., while inside the coverage area of the reader, this relatively low transponder transmit power could hardly result in adjacent channel interference, and no restriction on frequency variation is needed.

III. CONCLUSION

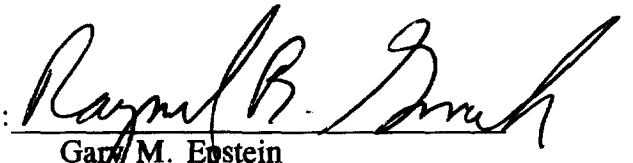
In its new rules for LMS, the Commission has made it possible for a variety of transportation-related services to be offered to the public. Many of these services, existing and yet to be developed, depend on use of active mobile transponders that can

exchange large amounts of information with the roadside infrastructure. The new frequency tolerance requirement for non-multilateration services will severely limit the viability of such services, however, and will undo a great deal of the progress that has already been made. The requirement is unnecessarily restrictive, in view of the limited range of such systems and the availability of informal coordination procedures, and, in any event, is not the best means to protect LMS systems from interference caused by out-of-band transmissions.

Accordingly, Hughes respectfully requests that the Commission eliminate this requirement entirely for non-multilateration systems, at least with respect to mobile transponders. For non-multilateration base stations, adjacent-channel interference, albeit unlikely, could be avoided by modifying the newly-adopted emission mask rule such that it would apply to the edges of licensed LMS bands, or by adopting the less restrictive tolerance of 0.066% of the authorized frequency. These alternatives would allay any concerns about interference without the devastating effects on the LMS industry, and on a number of ongoing projects in the public interest, that will result if the frequency tolerance rule remains unchanged.

Respectfully submitted,

HUGHES TRANSPORTATION MANAGEMENT SYSTEMS

By: 

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CERTIFICATE

I, Peter D. Shloss, hereby certify as follows:

1. I am employed as an engineer by Hughes Transportation Management Systems and am directly involved in development and implementation of the Vehicle to Roadside System.

2. I have reviewed the attached Petition for Reconsideration, of Hughes Transportation Management Systems, prepared by counsel.

3. The facts and technical findings stated in the attached petition are true and accurate to the best of my knowledge, information and belief.

Respectfully submitted,

Peter D. Shloss

CERTIFICATE OF SERVICE

I, Raymond B. Grochowski, do hereby certify that true and correct copies of the foregoing PETITION FOR RECONSIDERATION OF HUGHES TRANSPORTATION MANAGEMENT SYSTEMS were served this 24th day of April, 1995, by hand (except as otherwise indicated), upon the following:

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